

REPLACED BY  
ART 34 AMDT

# CLAIMS

1. A feedback control method of performing  
disturbance recovery control by giving a manipulated  
variable to a controlled system so as to make a  
controlled variable recover to a set point at the time  
of application of a disturbance, characterized by  
comprising:  
the step of dividing a response process of  
disturbance recovery control into three stages including  
a follow-up phase, a convergence phase, and a stable  
phase;  
the first phase switching step of switching to  
the follow-up phase at a disturbance application  
detection time point as a start time point of the  
follow-up phase;  
the follow-up phase manipulated variable  
determination step of continuously outputting a  
manipulated variable which makes the controlled variable  
follow up the set point in the follow-up phase;  
the second phase switching step of switching  
to the convergence phase at a disturbance recovery  
control elapsed time point, as a start time point of the  
convergence phase, at which the controlled variable does  
not exceed the set point in the follow-up phase;  
the convergence phase manipulated variable  
determination step of continuously outputting a  
manipulated variable which makes the controlled variable

27 converge near the set point in the convergence phase;  
28 the third phase switching step of switching to  
29 the stable phase at a time point, as a start time point  
30 of the stable phase, at which a preset state is reached  
31 in the convergence phase; and  
32 the stable phase manipulated variable  
33 determination step of continuously outputting a  
34 manipulated variable which makes the controlled variable  
35 stable at the set point in the stable phase.

2. A feedback control method according to  
2 claim 1, characterized in that the first phase switching  
3 step comprises the step of setting a time point, as the  
4 start time point of the follow-up phase, at which it is  
5 confirmed on the basis of a deviation between a set  
6 point and a controlled variable that a disturbance has  
7 been applied.

3. A feedback control method according to  
2 claim 1, characterized in that the first phase switching  
3 step comprises the step of setting a time point, as the  
4 start time point of the follow-up phase, at which a  
5 phase switching signal is input from an external unit  
6 which notifies application of a disturbance.

4. A feedback control method according to  
2 claim 1, characterized in that the second phase  
3 switching step comprises the step of calculating a  
4 predicted value of a remaining time for attainment which  
5 is a time taken for a current controlled variable to

reach the set point in the follow-up phase, on the basis of a deviation between the set point and the controlled variable and a controlled variable change ratio, and the step of setting a time point, as the start time point of the convergence phase, at which the calculated predicted value of the remaining time for attainment becomes smaller than a preset time index.

5. A feedback control method according to claim 1, characterized in that the third phase switching step comprises the step of setting a time point, as the start time point of the stable phase, at which a preset time index has elapsed.

6. A feedback control method according to claim 1, characterized in that the follow-up phase manipulated variable determination step comprises the step of continuously outputting a preset manipulated variable.

7. A feedback control method according to claim 1, characterized in that the convergence phase manipulated variable determination step comprises the step of continuously outputting a preset manipulated variable.

8. A feedback control device for dividing a response process of disturbance recovery control into three stages including a follow-up phase, a convergence phase, and a stable phase and performing disturbance recovery control by giving a manipulated variable to a

6 controlled system so as to make a controlled variable  
 7 recover to a set point at the time of application of a  
 8 disturbance, characterized by comprising:

9 a first phase switching unit which switches to  
 10 the follow-up phase at a disturbance application  
 11 detection time point as a start time point of the  
 12 follow-up phase;

13 a second phase switching unit which switches  
 14 to the convergence phase at a disturbance recovery  
 15 control elapsed time point, as a start time point of the  
 16 convergence phase, at which the controlled variable does  
 17 not exceed the set point in the follow-up phase;

18 a third phase switching unit which switches to  
 19 the stable phase at a time point, as a start time point  
 20 of the stable phase, at which a preset state is reached  
 21 in the convergence phase;

22 a first manipulated variable determining unit  
 23 which continuously outputs a manipulated variable which  
 24 makes the controlled variable follow up the set point in  
 25 the follow-up phase;

26 a second manipulated variable determining unit  
 27 which continuously outputs a manipulated variable which  
 28 makes the controlled variable converge near the set  
 29 point in the convergence phase; and

30 a third manipulated variable determining unit  
 31 continuously outputs a manipulated variable which makes  
 32 the controlled variable stable at the set point in the

33 stable phase.

9. A feedback control device according to  
2 claim 8, characterized in that said first phase  
3 switching unit sets a time point, as the start time  
4 point of the follow-up phase, at which it is confirmed  
5 on the basis of a deviation between a set point and a  
6 controlled variable that a disturbance has been applied.

10. A feedback control device according to  
2 claim 8, characterized in that said first phase  
3 switching unit sets a time point, as the start time  
4 point of the follow-up phase, at which a phase switching  
5 signal is input from an external unit which notifies  
6 application of a disturbance.

11. A feedback control device according to  
2 claim 8, characterized in that said second phase  
3 switching unit calculates a predicted value of a  
4 remaining time for attainment which is a time taken for  
5 a current controlled variable to reach the set point in  
6 the follow-up phase, on the basis of a deviation between  
7 the set point and the controlled variable and a  
8 controlled variable change ratio, and sets a time point,  
9 as the start time point of the convergence phase, at  
10 which the calculated predicted value of the remaining  
11 time for attainment becomes smaller than a preset time  
12 index.

12. A feedback control device according to  
2 claim 8, characterized in that said third phase

3 switching unit sets a time point, as the start time  
4 point of the stable phase, at which a preset time index  
5 has elapsed.

13. A feedback control device according to  
2 claim 8, characterized in that said manipulated variable  
3 determining unit continuously outputs a preset  
4 manipulated variable.

14. A feedback control device according to  
2 claim 8, characterized in that said second manipulated  
3 variable determining unit continuously outputs a preset  
4 manipulated variable.